

Appl. No. 10/651,821
Amdt. dated September 26, 2005
Reply to Office Action of May 24, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-18 (Canceled)

Claim 19 (Original): A method, comprising:

patterning a masking material over a substrate having an opening to a contact node formed on the substrate;

creating an interconnection element having a base coupled to the contact node and a free end extending over a portion of the masking material, the interconnection element comprising a first element material and a second element material;

removing the masking material; and

transforming a property of one of the first element material and the second element material of the interconnection element to modify the shape of the interconnection element.

Claim 20 (Original): The method of claim 19, wherein transforming comprises transforming each of the first element material and the second element material.

Claim 21 (Original): The method of claim 19, wherein transforming comprises heating the interconnection element to a temperature.

Claim 22 (Original): The method of claim 19, wherein transforming produces a volume change in one of the first element material and the second element material.

Claim 23 (Original): The method of claim 19, wherein the transformable property comprises stress and transforming comprises modifying the magnitude of the stress.

Claim 24 (Original): The method of claim 19, wherein the transformation biases the free end of the interconnection element from a first position to a second position that is a greater distance from a surface of the substrate.

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Claim 25 (Original): The method of claim 24, further comprising limiting the transformation bias of the free end of the interconnection element.

Claim 26 (Original): The method of claim 19, further comprising:
introducing a third element material having a resilient property over the interconnection element.

Claim 27 (Original): The method of claim 26, wherein the introduction of the third element material comprises electroplating a conductive alloy.

Claim 28 (Original): The method of claim 26, wherein the interconnection element is coupled to a surface of the substrate and the third element material is introduced over a surface of the interconnection element opposite the substrate surface, the method of introducing the third element material comprising:

 patterning a masking material over the substrate to have an opening exposing the surface of the interconnection element; and

 introducing the third element material to the exposed surface of the interconnection element.

Claim 29 (Original): The method of claim 28, wherein the masking material is an electrophoretic resist material.

Claim 30 (Original): The method of claim 28, wherein the third element material is introduced by electroplating.

Claim 31 (Withdrawn): The method of claim 19, wherein the second element material is coupled to the first element material at a side opposite the substrate and the second element material comprises the transformable property, the method further comprising:

 after transforming the property, removing the second element material.

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Claim 32 (Withdrawn): The method of claim 31, wherein the second element material comprises a shape memory alloy and creating an interconnection element comprises introducing the second element material in a martinsite state and transforming a property of the second element material comprises transforming the second element material to a memory state, the second element material having a volume in its memory state that is different than a volume in its martinsite state.

Claim 33 (Withdrawn): The method of claim 32, wherein after transforming the property, the method further comprising:

annealing the interconnection element.

Claim 34 (Original): The method of claim 19, prior to creating an interconnection element, re-distributing the contact node from a first contact point on the substrate to a different second contact point on the substrate and creating the interconnection comprises coupling the base at the second contact point.

Claim 35 (Original): The method of claim 19, further comprising:

after transforming, coupling the substrate to contact nodes on an electronic component at the released end of the interconnection element.

Claim 36 (Original): The method of claim 35, further comprising:

after coupling, testing one of the substrate and the electronic component.

Claim 37 (Original): The method of claim 36, wherein the electronic component comprises a die and the released end of the interconnection element is coupled to a bond pad of the die.

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Claim 38 (Previously presented): A method comprising:

forming an interconnection element on a surface of a first substrate, the interconnection element comprising a first element material and a second element material and a base end coupled to a contact node on the first substrate and a free end;

transforming a property of one of the first element material and the second element material to modify the shape of the interconnection element, the transformed property causing the interconnection element to bend without the application of an external force; and

coupling the interconnection element at the free end to a contact node on a second substrate.

Claim 39 (Original): The method of claim 38, wherein forming the interconnection element comprises forming a plurality of interconnection elements coupled to corresponding contact nodes on the first substrate and coupling the interconnection element comprises coupling the plurality of interconnection elements to corresponding contact nodes on the second substrate.

Claim 40 (Original): The method of claim 39, wherein coupling comprises bringing the free ends of the plurality of interconnection elements together with corresponding contact nodes with a sufficient contact force to make a pressure connection.

Claim 41 (Original): The method of claim 39, wherein the plurality of interconnection elements comprise first interconnection elements coupled to corresponding first contact nodes on a first surface of the first substrate and second interconnection elements coupled to corresponding second contact nodes on a second surface of the first substrate,

wherein the first interconnection elements are coupled to the contact nodes on the second substrate.

Claim 42 (Original): The method of claim 41, further comprising coupling the second interconnection elements to corresponding contact nodes of a third substrate in an interposer application.

Claim 43 (Original): The method of claim 39, further comprising testing the second substrate.

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Claim 44 (Original): The method of claim 39, wherein the second substrate is a circuit board,

Claim 45 (Original): The method of claim 39, wherein the contact nodes of the second substrate comprise external connection points, the method further comprising:

coupling the external connection points of the second substrate to corresponding contact nodes of a third substrate.

Claim 46 (Original): The method of claim 39, wherein coupling comprises a temporary connection to the second substrate.

Claim 47 (Original): The method of claim 39, wherein coupling comprises a permanent connection to the second substrate.

Claim 48 (Original): The method of claim 47, wherein coupling comprises soldering the free ends of the interconnection elements to the corresponding contact nodes of the second substrate.

Claim 49 (Original): The method of claim 39, wherein the second substrate is part of a system.

Claim 50 (Original): The method of claim 49, wherein the system comprises one of an integrated circuit test system and a substrate system.

Claim 51 (New): The method of claim 19, wherein:

the transforming step comprises applying a stimulus to the interconnection element, and the stimulus triggers the transforming of the property.

Claim 52 (New): The method of claim 51, wherein the first element material reacts differently to the stimulus than the second element material, which causes the modifying of the shape of the interconnection element.

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Claim 53 (New): The method of claim 51, wherein:

the stimulus comprises heat,

the first element material has a first coefficient of thermal expansion, and

the second element material has a second coefficient of thermal expansion that is different than the first coefficient of thermal expansion.

Claim 54 (New): The method of claim 19, wherein the transforming step comprises applying a stimulus to the interconnection element that causes the first material element to expand at a first rate and the second element material to expand at a second rate that is different than the first rate, which causes the modifying of the shape of the interconnection element.

Claim 55 (New): The method of claim 38, wherein:

the transforming step comprises applying a stimulus to the interconnection element, and
the stimulus triggers the transforming of the property.

Claim 56 (New): The method of claim 55, wherein the first element material reacts differently to the stimulus than the second element material, which causes the modifying of the shape of the interconnection element.

Claim 57 (New): The method of claim 55, wherein:

the stimulus comprises heat,

the first element material has a first coefficient of thermal expansion, and

the second element material has a second coefficient of thermal expansion that is different than the first coefficient of thermal expansion.

Claim 58 (New): The method of claim 38, wherein the transforming step comprises applying a stimulus to the interconnection element that causes the first element material to expand at a first rate and the second element material to expand at a second rate that is different than the first rate, which causes the modifying of the shape of the interconnection element.